



The Risk-Informed Decision Framework for LACPR and MsCIP

15 May 2007



Objectives for Risk-Informed Decision Framework (RIDF)

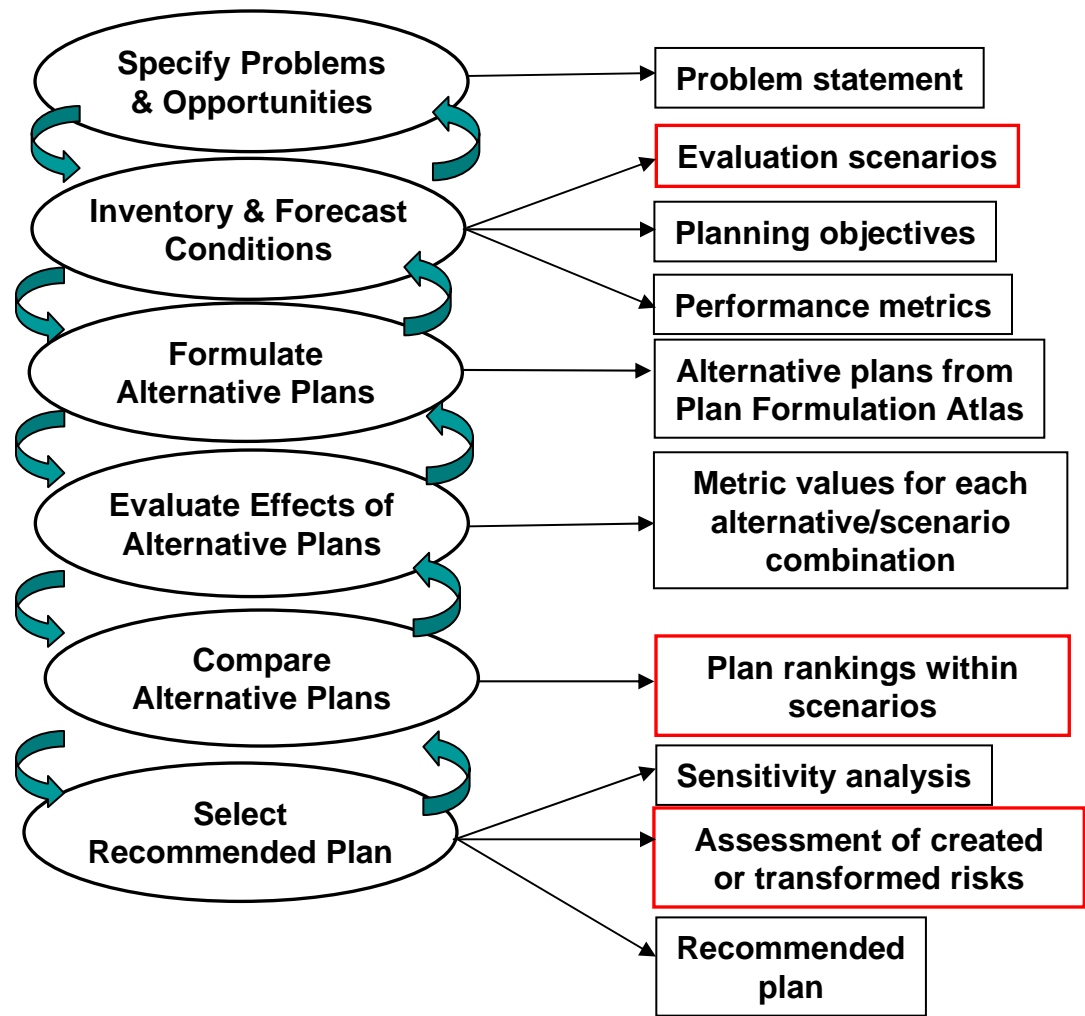
- Broader than traditional NED analysis
- Solidly founded upon the Corps' planning process
- Incorporate risk and uncertainty information into the decision process
- "Simply and clearly show to decision makers and the public the risks, costs, and consequences of..." plans
 - Provides the means to score and rank plans
- Promote transparency in decision making
- Provide a structure and process that facilitates interaction with partners and stakeholders
 - Promote understanding
 - Promote credibility and legitimacy
- Facilitate adaptive planning and engineering



Recent History and Progress

- *Adaptive Risk-Informed Decision Framework for the Mississippi Coastal Improvements Program (MsCIP)*, 34 pp; white paper prepared for SAM dated 15 January 2007
- Workshop on Risk-Informed Planning for Coastal Protection and Restoration, 18-19 Jan. 2007 in Mobile, AL
- LACPR RIDF workshop, 13-14 Feb., 2007 in New Orleans, LA
- *Risk Informed Decision Framework for Louisiana Coastal Protection and Restoration (LACPR)*, 56 pp; white paper prepared for MVN dated 5 March 2007
- External Peer Review of RIDF for LACPR White Paper; 9 March 2007
- *Risk Informed Decision Framework for Louisiana Coastal Protection and Restoration (LACPR)*; 24 April, 2007; <http://lacpr.usace.army.mil/>

RIDF





Problems and Opportunities

- Specify problem
- Structure project objectives
- Establish clear linkage between objectives and metrics used to evaluate plans
- Develop a coherent set of metrics
 - Numerical and categorical
 - Establish means to develop uncertainty estimates for metrics



LaCPR Planning Objectives

- Reduce risk to public safety from catastrophic storm inundation
- Reduce damages from catastrophic storm inundation
- Promote a sustainable ecosystem
- Restore and sustain diverse fish and wildlife habitats, and
- Sustain the unique heritage of coastal Louisiana by protecting historic sites and supporting traditional cultures

LaCPR Risk Metrics

- People
 - Resident/exposed population
- Economy
 - Expected Annual Damages
 - Regional Economic Development (jobs, income, regional output)
 - Life-Cycle Costs; Implementation, O&M
 - Residual risk; EAD with projects
- Environment
 - Net wetland acreage
 - Spatial integrity
 - Indirect impacts
 - Storm damage reduction
- Culture
 - Cultural sites protected



MsCIP Planning Objectives

- Reduce risk to public health and safety from catastrophic storm inundation.
- Reduce storm damages to infrastructure from catastrophic storm inundation.
- Restore and protect upland and tidal wetland habitats.
- Reduce residual risk from catastrophic storm damage.

MsCIP Risk Metrics

- People
 - Resident/exposed population
 - Mental health threats
- Economy
 - Expected annual damages
 - Regional Economic Development (jobs, income, sales)
 - Long-term sustainability of plan
 - Costs to implement plan
- Environment
 - Tidal ecosystem functions lost
 - Tidal ecosystem functions restored
 - Upland ecosystem functions lost
 - Upland ecosystem functions restored



Scenario Analysis

- Address future uncertainties through scenario analysis
- Example: Four scenarios under development in LaCPR including combinations of the following conditions:
 - Sea level rise/subsidence
 - Storm activity
 - Economics and development



Evaluate Plans

- Storm modeling provides surge and wave information against which to evaluate plans
- Example: 4 performance conditions of interest for LaCPR
 - High Cat 5
 - Low Cat 5
 - Katrina-like event
 - 100-yr event
- Plan performance evaluated in terms of metrics
 - Uncertainty in performance is quantified



Compare Effects of Plans

- Metrics used to calculate a quantitative score, with associated uncertainty, for each plan
 - Technical team develops weights for metrics
 - Survey partners and stakeholders for their weighting preferences
 - Used as information source for technical team
 - Develop value landscape for basis of comparison
- Trade-off analysis to refine list of measures
 - Explore “conflicts” among objectives
- Sensitivity analysis to explore robustness of plan rankings
 - Facilitate negotiation among decision-makers and stakeholders



Identify Recommended Plan

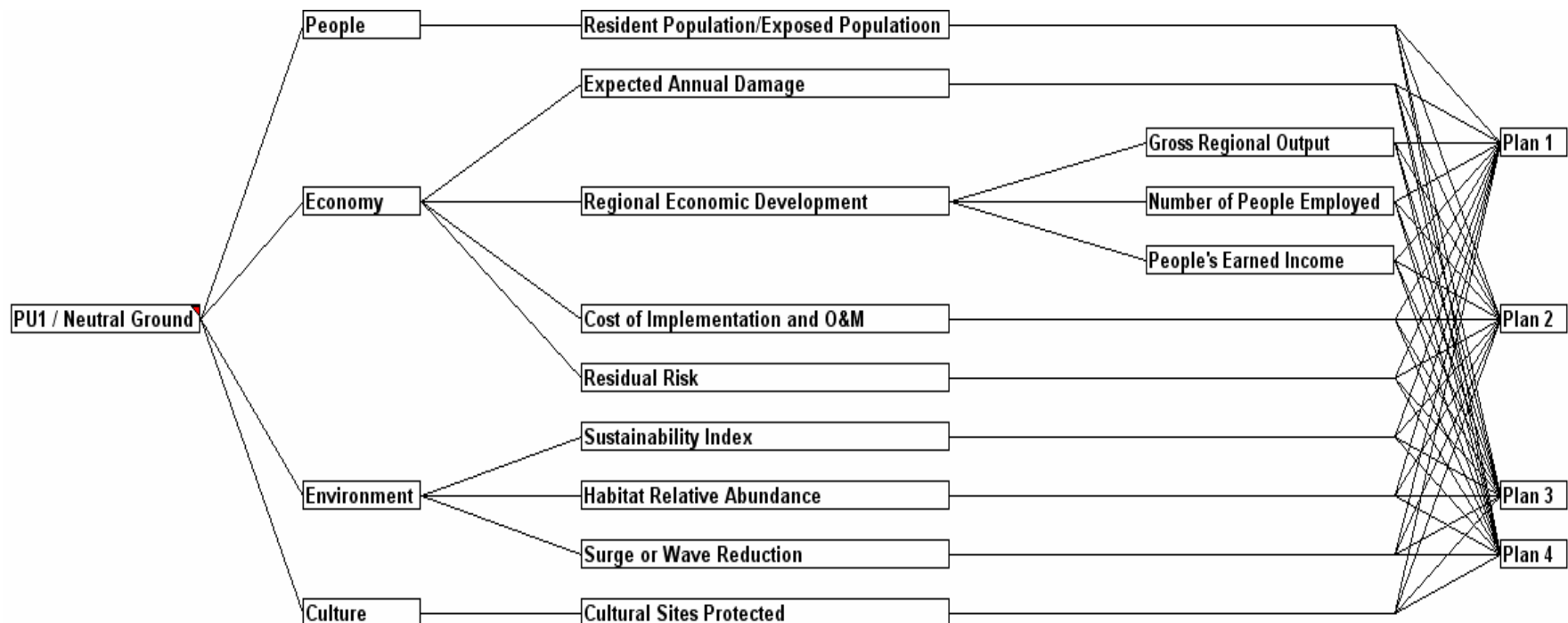
- Recommendations based on
 - Performance evaluation
 - Value and weighting information for metrics
 - Uncertainties
 - Robustness of ranking based on
 - scenario analysis and
 - sensitivity analyses
- Quantitative decision analysis (using MCDA) promotes transparency and understanding
- Quantitative scoring provides opportunity to assess the value of new information for decision-making
 - E.g., additional study to reduce key uncertainties
- Subject top plan(s) to more detailed risk assessment
 - What can go wrong?
 - How could plan be improved?
 - Incorporate into adaptive management plan



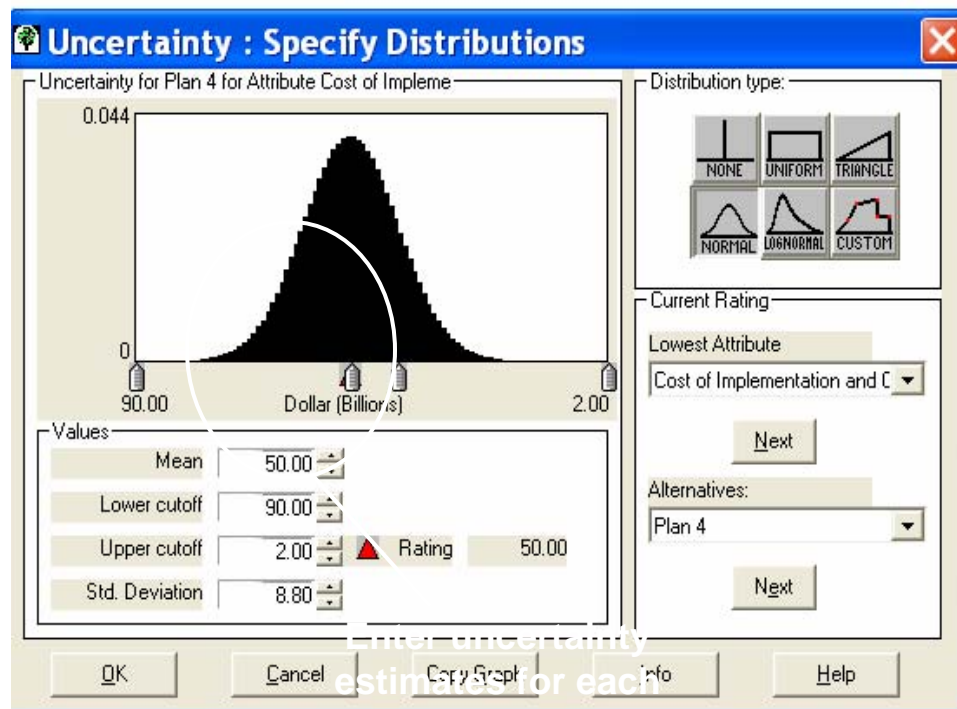
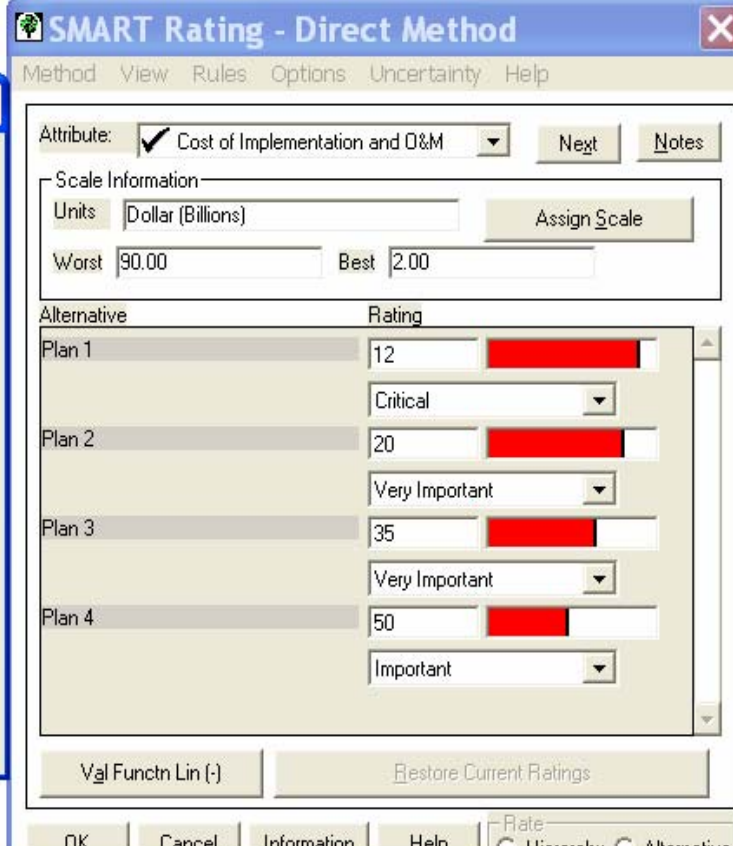
Multiple Criteria Decision Analysis

The following slides provide a hypothetical Multiple Criteria Decision Analysis (MCDA) example for LaCPR

Decision Hierarchy for LaCPR Planning Unit 1



Values and Uncertainty for each LaCPR Metric

SMART Rating - Direct Method

Method View Rules Options Uncertainty Help

Attribute: ☒ Cost of Implementation and O&M

Scale Information:

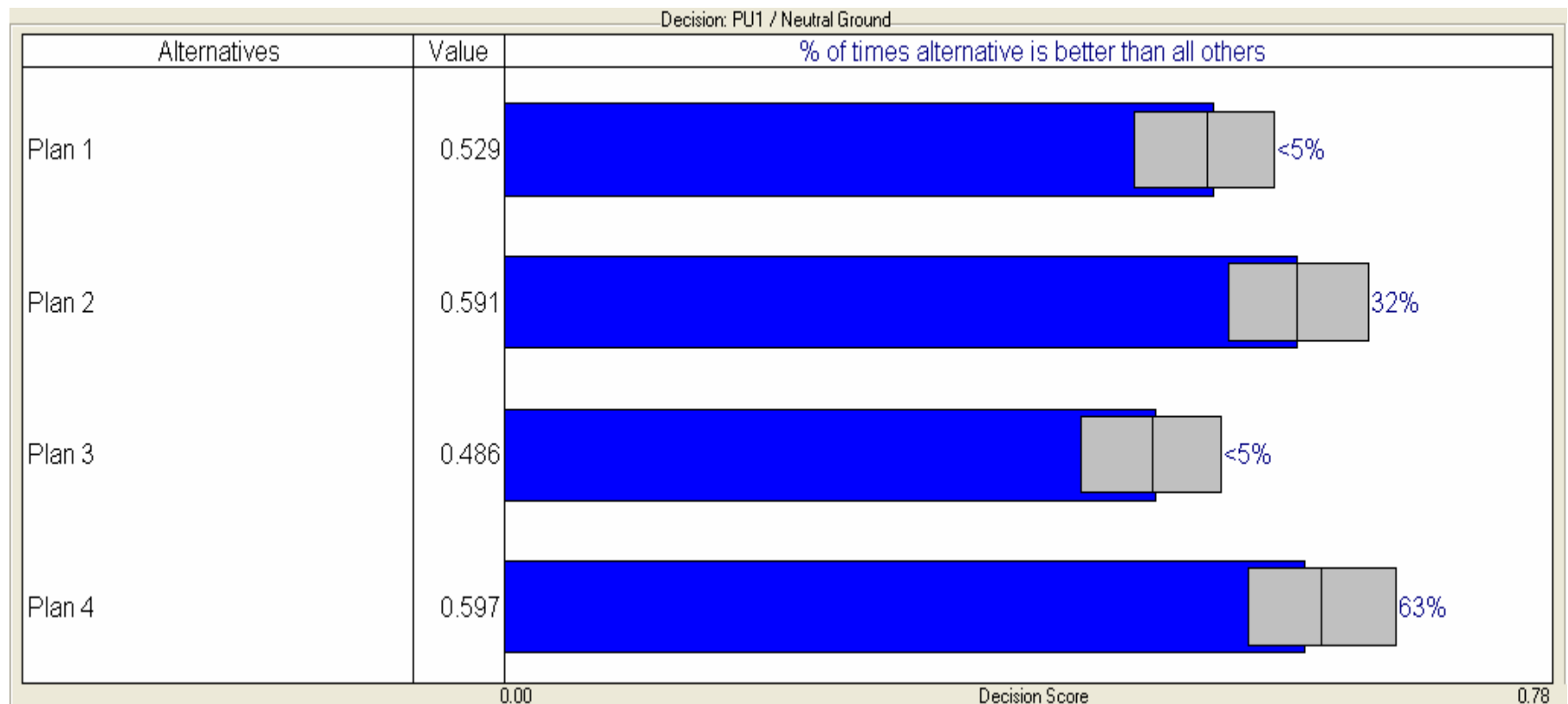
Units: Dollar (Billions)

Worst: 90.00 Best: 2.00

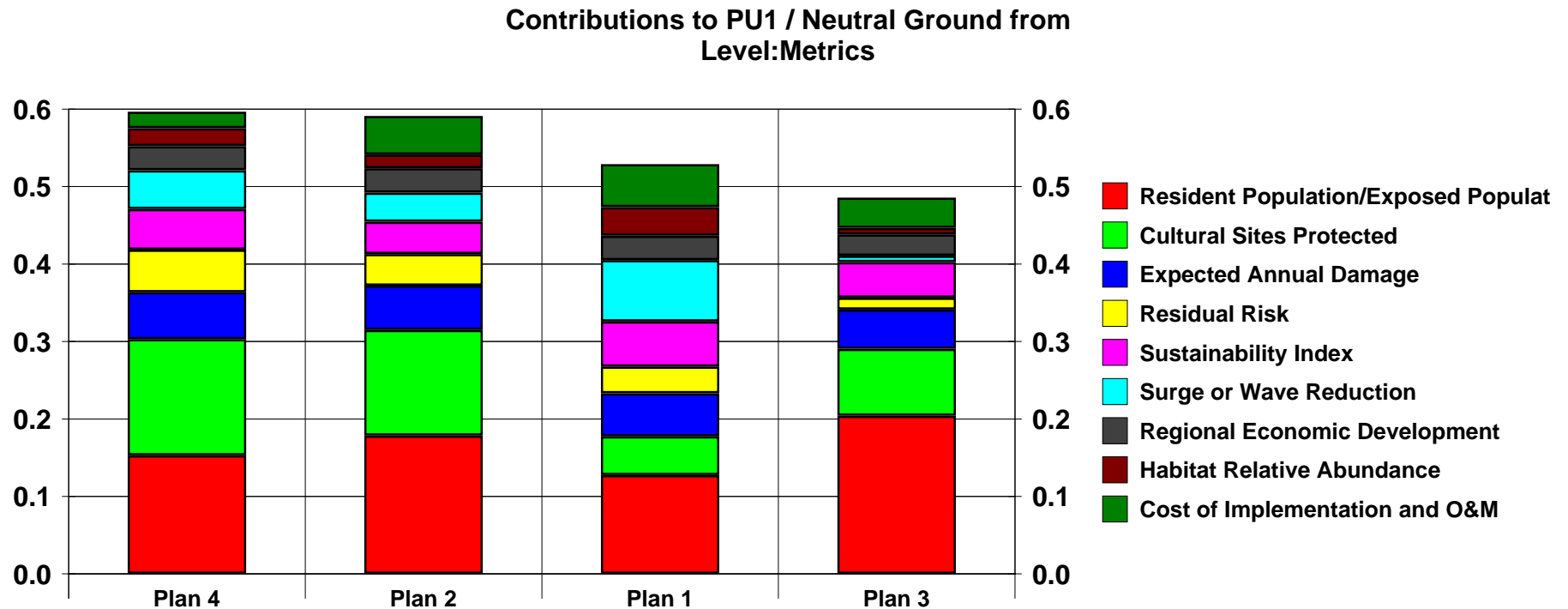
Alternative	Rating
Plan 1	12
Plan 2	20
Plan 3	35
Plan 4	50

Buttons: OK, Cancel, Information, Help, Rate Hierarchy, Alternative

Decision Scores with Uncertainty for PU1 for the Neutral Ground Scenario

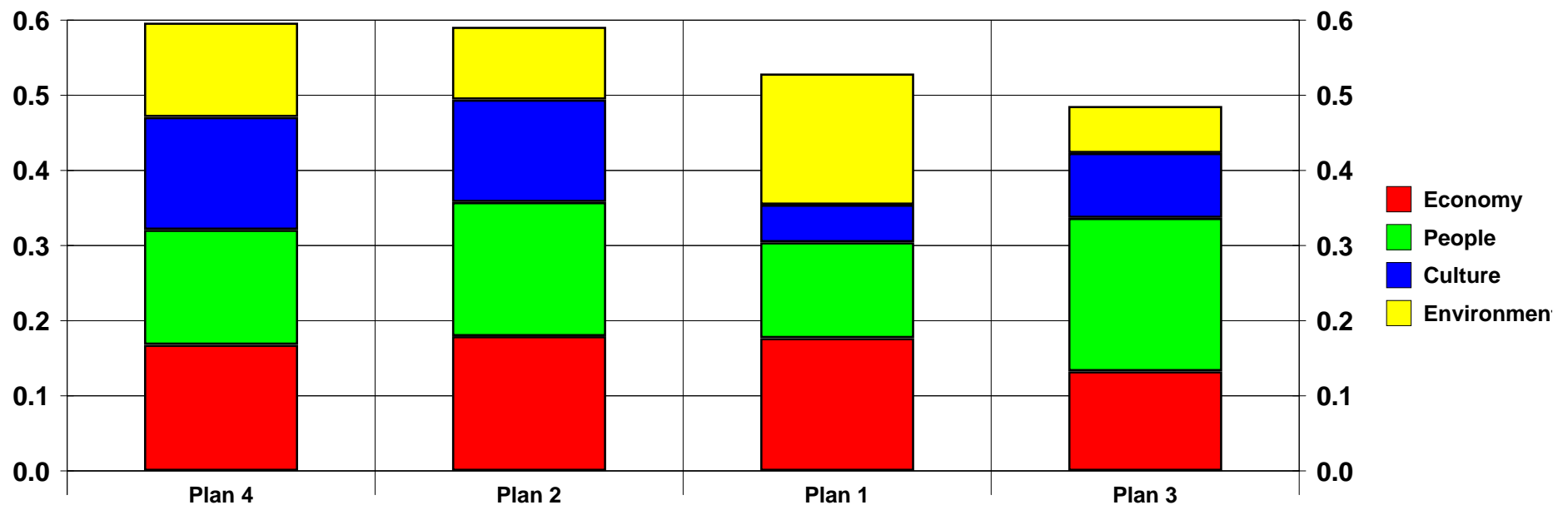


LaCPR Decision Contributions by Metric



Decision Contributions by Objective

Contributions to PU1 / Neutral Ground from
Level: Objectives



Decision Scores with Uncertainty given Differing Weights for the Cost Metric

Weights

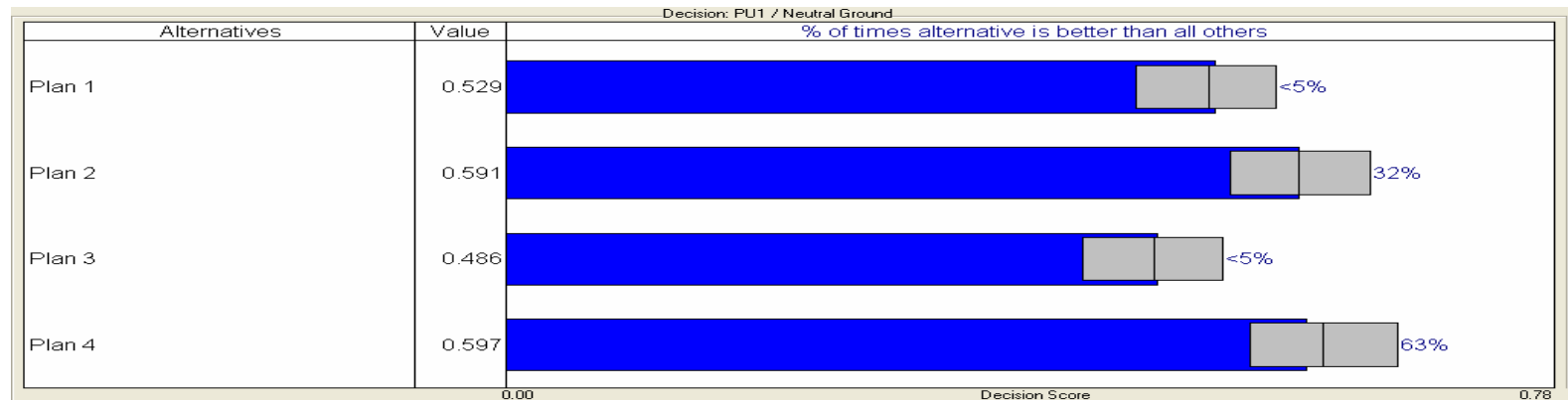
EAD 25

RED 25

Cost 25

Res.

Risk 25



Weights

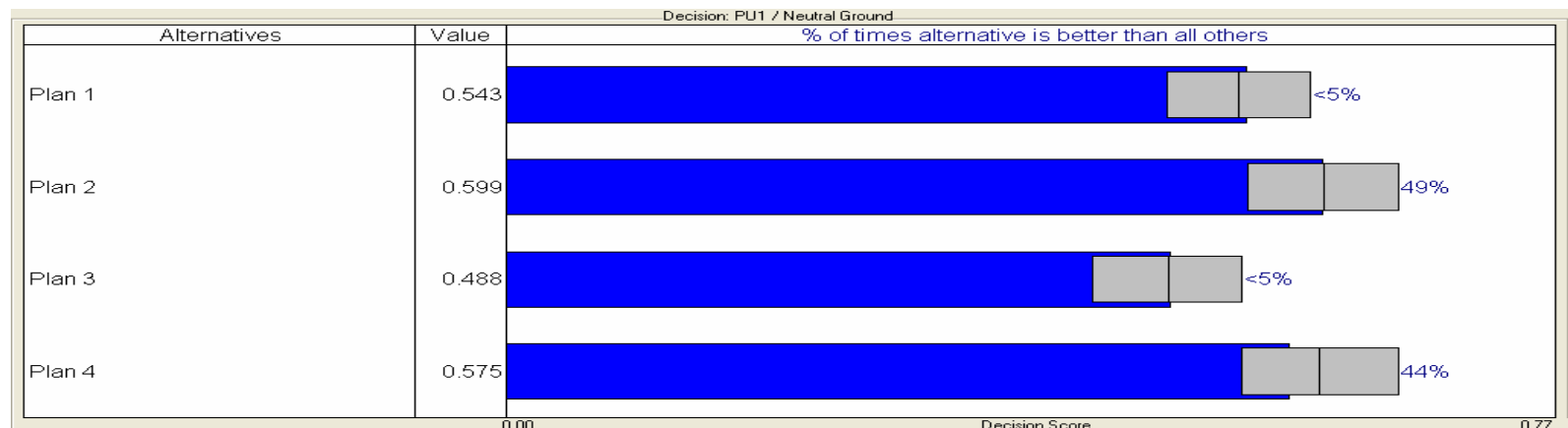
EAD 15

RED 10

Cost 50

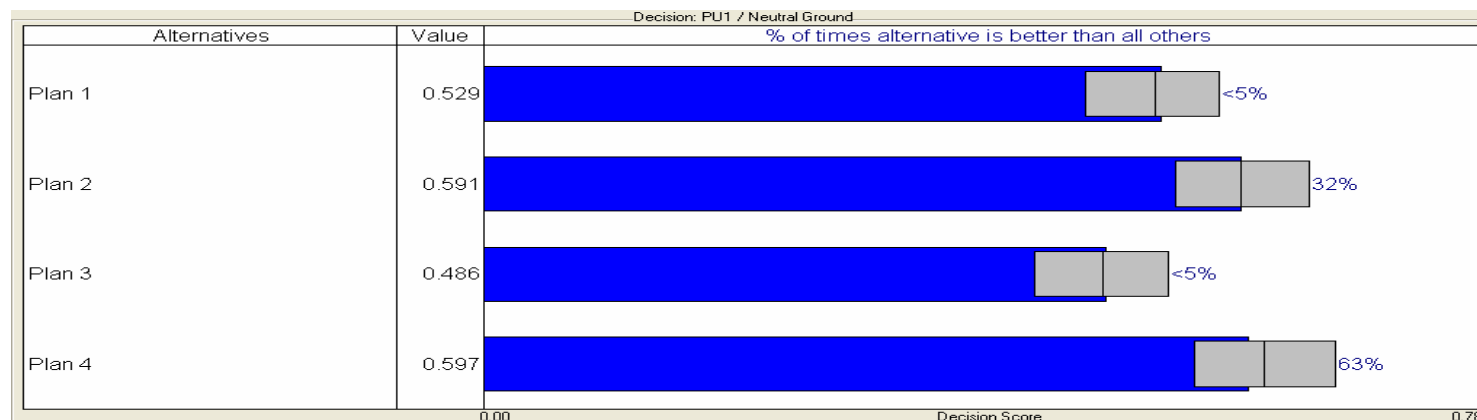
Res.

Risk 25

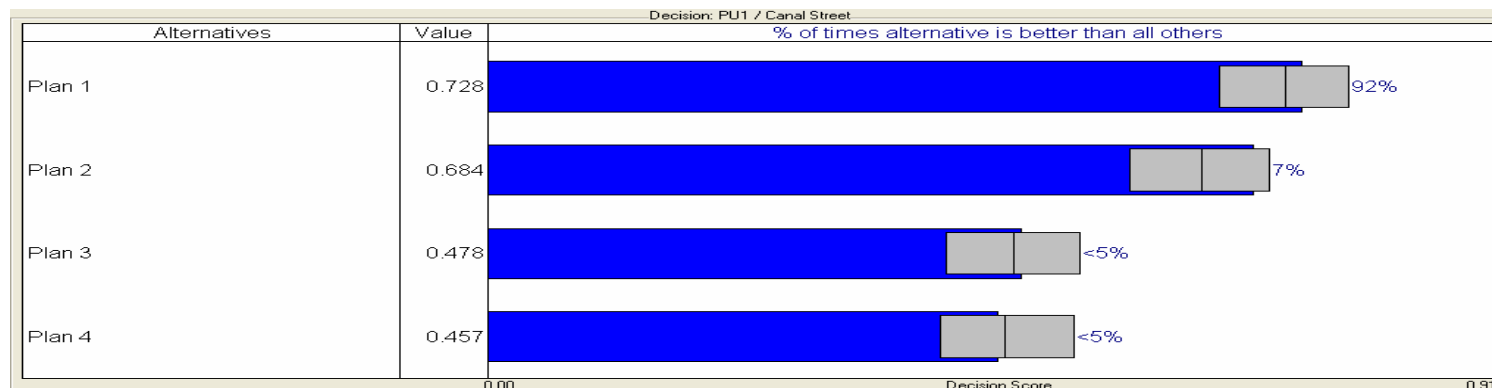


Decision Scores: Neutral Ground vs. Canal Street Scenarios

Neutral Ground Scenario



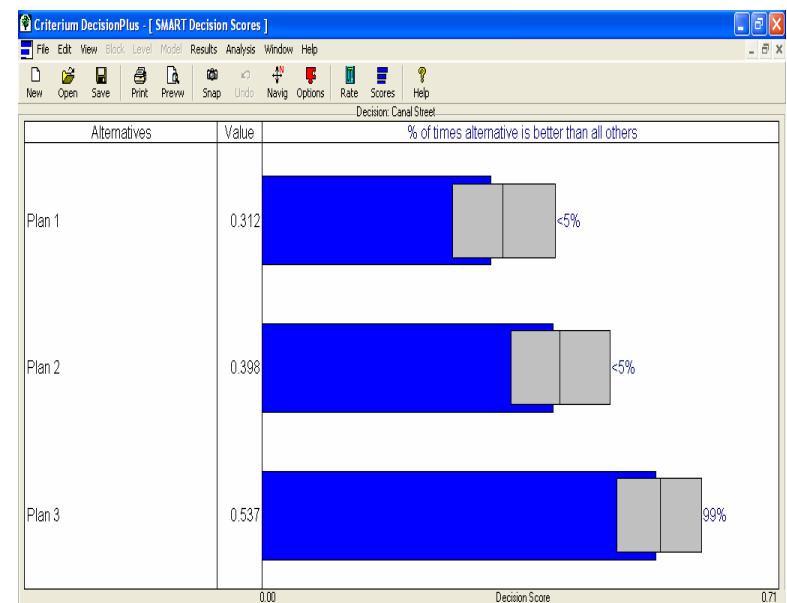
Canal Street Scenario





Functions and Outputs of the RIDF

- Identify, assess, communicate the risks to life, health, the environment and economics
 - residual risks associated with risk mitigation plans;
- Account for the major uncertainties that could affect the performance of plans in the future;
- Identify data gaps that could influence decisions;
- Provide the basis for ranking the performance of alternative plans based on risk metrics and values
- Establish confidence levels for planning decisions and recommendations.





Assembling a System

- A coordinated set of plan components assembled to meet planning objectives for LaCPR and MsCIP
 - Will include complementary combinations of structural, non-structural and ecosystem measures
 - Guided by consistent application of planning objectives and risk metrics
 - Responsive to changes in the nature of the assets being protected across the planning area
 - Phased implementation is coordinated to maximize performance of the system and opportunities to learn and adapt



Discussion